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FACTS
ABOUT
PEST
CONTROL

THE WAR THAT NEVER ENDS

The protection of man, his food and fiber supplies, and his forests from the ravages of pests of all kinds is essential to the continued growth and strength of America and the progress and well-being of its people.

Even with modern pest control methods, harmful insects, diseases, nematodes, and weeds still cause serious damage to crops and livestock, with the estimated loss amounting to nearly one-fourth of our total yearly production. The cost of controlling these pests comes to over \$3.1 billion a year.

Some 10,000 species of insects in the United States are classed as public enemies, of which several hundred are particularly destructive and require some measure of control. Other pests capable of causing serious economic loss include 600 weed species, 1,500 plant diseases, and 1,500 species of nematodes (microscopic worms).

Of the 457 million acres of farmland in the United States, 15 percent (69 million acres) produces crops needing some degree of protection from insect pests. Some form of weed control is used on all cropland and also on a high percentage of the more than one billion acres of forage and grazing land. Most grain and all cotton seed requires chemical treatment for prevention of plant diseases.

CHEMICALS -- A MAJOR WEAPON AGAINST PESTS

Pesticides are generally the most effective and, in many instances, the only weapons available to fight pests that damage or destroy crops, livestock, and forests or endanger human health and our natural resources.

The development since 1945 of modern pesticides, together with other technical advances, has made possible a spectacular advance in American agricultural efficiency. During the past two decades, farm output per acre has increased by at least a third, keeping pace with the needs of an exploding population at home and growing markets abroad.

At the same time, these chemicals have played a major role in protecting man's health and well-being. They not only are used to produce and protect the abundance and nutritional quality of our food, but serve us directly in suppressing the pests that transmit malaria, yellow fever, typhoid, and many other diseases, and in controlling poisonous plants.

USDA Policy on Pesticides

The U. S. Department of Agriculture has major responsibilities for protecting man, animals, plants, farm and forest products, and communities and households against pests. In carrying out these responsibilities, the Department seeks to:

- (1) Protect the health and well-being of people who use pesticides and consumers who use food and other products protected by pest control chemicals, and
- (2) Protect fish, wildlife, soil, air, and water from pesticide pollution.

The Agriculture Department uses in its own pest control programs and encourages others to use those means of effective pest control which provide the least potential hazard to man and wildlife and least danger of air and water pollution.

The Department strongly supports the use of biological, cultural, mechanical, and ecological pest control methods or non-persistent and low toxicity pesticides whenever such means will do the job effectively and safely. When residual or long-lasting pesticides are necessary, the Department urges they be used in the smallest effective amounts applied precisely to the infested area, and no more often than needed for effective control or elimination of the target pest.

The Department implements this policy through its own research and control programs. USDA scientists recently developed a new low-volume spraying technique for applying undiluted malathion, an effective but non-persistent chemical of low toxicity to warm-blooded animals. The technique has been used successfully against grasshoppers, cereal leaf beetle, boll weevil, and spruce budworm. In boll weevil spraying, this low-volume method has reduced the amount of insecticide used per acre from three gallons of liquid to 16 ounces of undiluted malathion. One planeload can do the work which previously required 23 planeloads. Before any pesticide can be registered with directions for low volume application, adequate data must be available to show that the use would be safe, effective, and would not result in illegal residues on food.

The Federal-State program to control the imported fire ant, begun in 1957 in the Southeastern State initially used 2 lbs. of heptachlor per acre for control. Continued USDA research cut use to 1-1/4 lbs. per acre, and then to two applications of only 1/4 lb. spaced 3 to 6 months apart. Finally, heptachlor was entirely replaced with the much less toxic mirex bait which is considerably less hazardous than heptachlor.

The average number of fungicide applications needed to control potato late blight in the northcentral and northeastern states has been reduced from ten to five per year. USDA scientists made this possible through development of more accurate disease forecasting and related proper timing of fungicide applications.

As a result of research work, the U. S. Department of Agriculture has switched from the use of pesticides to insect sterilization in the battle to keep the Mexican fruit fly under control along the border with Mexico. Male flies treated with either chemosterilants or gamma radiation are released to mate with females, thereby preventing reproduction and keeping the fly population in check.

Pesticides and the Farmer

The use of chemicals to fight pests dates back at least to the ancient Greeks who employed brimstone (sulfur) as an insecticide. Common salt probably was used in ancient times as the first chemical weed killer.

In the U.S., settlers in the Great Plains in 1869 prevented their own starvation by use of Paris green, a crude arsenical, to save their potato crops from the Colorado potato beetle. Settlers also treated their grain seeds with copper sulfate to protect grain from plant disease.

In recent years, pesticides have become a common tool of progressive farmers. Last year, nearly \$1 billion worth of pesticides were used to produce and protect agricultural and forest products.

Herbicides were used for weed control on more than 70 million acres of agricultural land in 1962 at a cost of more than \$272 million. Principal application: approximately 25 million acres of corn, 6 million acres of cotton, 3 million acres of soybeans, 20 million acres of small grains, and 7 million acres of pasture and range-land. Herbicide usage is increasing markedly each year.

It is estimated that insecticides are used by farmers to protect 32-1/2 million acres of grains (including corn, feed sorghum, and rice), 12 million acres of cotton, 2-1/2 million acres of fruit and nuts, 2 million acres of vegetables (including potatoes), and about 20 million acres of other crops. These treated crops occupy about 15 percent of the total crop acreage.

Of the 758 million acres of forest land, less than three-tenths of one percent is subjected to any pesticide treatment in any one year.

Ninety-seven percent of our native grasslands have never had a pesticide applied to them. About 75 percent of the total land area of the U. S. has never had any pesticide applied to it.

Pesticides and the Consumer

The effectiveness of modern pesticides in controlling agricultural pests helps keep food cost down and quality high. It is estimated that if pesticides were to be completely withdrawn from farm use, crop and livestock production in the United States would drop by 25 to 30 percent.

This sharp cut in production could boost the price of farm products by 50 to 75 percent, and increase food's **share** of the family budget from less than one-fifth at present to as much as one-third. The quality of this reduced supply of vegetables, fruit, meat, and other food items would be visibly poorer than at present.

Without pesticides, potato production would be virtually wiped out in the East by disease, and peaches and citrus fruit probably would be destroyed by insects and disappear almost completely from food markets.

During the Second World War, production of sweet corn in the United States was greatly reduced due to the depredations of the European corn borer and the corn earworm. In 1946, blight destroyed over 50 percent of the tomato crop in ten states. These popular table foods were restored to full production through protection with modern pesticide.

Some of the American consumer's favorite vegetables might be priced out of the food markets if weeding on farms was still done by costly hand labor instead of with chemical weed killers.

Pesticides in the Home and Garden

Approximately 15 percent of all pesticides sold are purchased for home and garden use, and last year totaled over 50 million pounds of insecticide preparations. By controlling destructive or disease-carrying pests, these chemicals help make possible our modern way of life.

The aerosol principle, now a commonplace method of applying insecticides in the home as well as dispensing everything from deodorants to whipped cream, was invented during World War II by U. S. Department of Agriculture scientists. About 80 million aerosol "bug bombs" were sold in 1965 for use against such common home pests as flies, mosquitoes, roaches, and ants, and for protection of flowers and ornamentals.

Wildlife Conservation and Pest Control

Protecting man, his food, and his fiber against pests is conservation in the broadest sense of the word. Protecting wildlife is a vital part of the Department's dedication to conservation.

The nation's farmers, ranchers, and foresters play a key role in maintaining an abundant wildlife population because it is their agricultural and forest lands that provide the habitat for most of the nation's wildlife.

USDA takes this fact into account in conducting research and helping landowners and operators plan the water conservation measures now in use on two million American farms.

The Soil Conservation Service of the U. S. Department of Agriculture reports that in 1964 there were 7.9 million acres devoted to preserving wildlife habitat within the nation's 2,989 Soil Conservation Districts. In 1965, our farm and ranch lands contained over 1.4 million man-made ponds, 3,891 multi-purpose dams, 30,525 miles of hedgerow, 11.8 million acres of seeded rangeland, 11.8 million acres planted in trees, and numerous other conditions favoring the expansion of our wildlife and fish populations.

Pesticides are used in ways directly beneficial to wildlife. For example, herbicides are employed to eliminate poisonous plants and brush from rangeland and aquatic weeds from ponds, lakes, and streams. Treated rangeland is replanted with forage suitable for grazing by antelope, deer, elk, and other wildlife species as well as cattle. Elimination of aquatic weeds permits growth of food plants needed by fish and other aquatic life.

Increases of up to 65 percent in the deer populations have been reported in areas of Texas from which the screwworm fly, a highly destructive animal parasite, had been recently eradicated by the USDA, with non-chemical means, in cooperation with southern states and livestock producers in those states.

National forests, administered by the Forest Service of the Department of Agriculture, shelter many species of fish, birds, and mammals. Through careful planning and supervision, pesticides can and are being used to protect timber and range values in these forests without adversely affecting wildlife populations or their habitat.

About one-third of the big game animals taken by hunters in the U. S. comes from the national forests. In recent years, the population of deer, bear, antelope, elk, moose, and other big game in these forests has been at one of the highest levels recorded in the past two decades, according to Forest Service estimates.

In the application of pesticides to forest lands, the Forest Service carefully delineates the infested areas to be treated, marks off buffer zones bordering lakes and streams, and monitors the effects of certain pesticides on wildlife and fish in and near treated areas. Federal and State fish, wildlife, and public health agencies are consulted during the planning of chemical pest control projects by the Forest Service and are often directly involved in the monitoring of these projects.

The control of diseases, insects, weeds, and other pests harmful to man, livestock, farm crops, and forests contributes directly to preserving an abundant and healthy wildlife population.

PROTECTING PRODUCERS AND CONSUMERS

The U. S. Department of Agriculture carries out many programs and works with other agencies to help safeguard men, animals, and their environment from the ravages of pests and from potential hazards associated with pesticide use. Federal laws and regulations administered by USDA govern the movement and sale of pesticides in interstate commerce. Pest quarantine barriers are maintained to keep foreign pests from entering the country. Monitoring programs keep watch on pesticide residue levels, if any, in meat and poultry products, and measure the effect on agricultural pesticides generally. Continuing research is conducted in an effort to find better and safer pest control methods. Public education and information programs promote the safe use of pesticides.

Registration

Every commercial pesticide formulation must be registered with the U. S. Department of Agriculture before it can be sold in interstate commerce. Before registration is granted, a pesticide must meet rigid tests, proving its claimed effectiveness against a particular pest or pests and demonstrating its safety to humans, crops, livestock, and wildlife when used as directed.

A pesticide manufacturer often must undertake as much as 3 to 5 years of exacting scientific research to obtain proof acceptable to the U. S. Department of Agriculture of the safety and effectiveness of a single new pest control chemical. In addition, the Department itself conducts intensive research on pesticides to assure the development of effective and safe use practices.

In the two decades since the development of DDT, 2,4-D, and other pest control chemicals, over 60,000 pesticide formulations based on more than 800 individual active chemical ingredients have been registered with the U. S. Department of Agriculture's Agricultural Research Service.

When application is made for registration of a pesticide with directions for use on food or feed crops, the U. S. Department of Agriculture withholds registration and notifies the applicant that he must petition The Federal Food and Drug Administration for a tolerance to cover any residues resulting from such use. This legally enforceable level is set well below the point at which residue might be harmful to consumers.

A three-way agreement was concluded in 1964 providing for coordination among the Departments of Agriculture, Health, Education, and Welfare, and Interior on the clearance of pesticide registration applications and the establishment of residue tolerance levels.

Forty-eight states have laws which in some degree regulate the sale and use of pesticides within the state. A number of states also set residue tolerance limits for foodstuffs grown and marketed within the state's boundaries.

Labeling

Federal regulations regarding pesticide labels are designed to protect both the user of pesticides and persons who may also be exposed. The law requires that key warning and caution statements be displayed on the front panel of pesticide labels. The nature and scope of any safety claim on the label must conform to the proven facts.

All pesticide labels must bear registration numbers indicating the product has been accepted by the U. S. Department of Agriculture as adequate to permit both safe and effective use when label directions are followed.

During 1965, the U. S. Department of Agriculture had U. S. Marshals seize 71 shipments of separate pesticidal products on charges that the products were shipped interstate in violation of the Federal Insecticide, Fungicide, and Rodenticide Act. Alleged violations included lack of Federal registration, adulteration, misbranding, and other illegal practices.

Watching for Residue

USDA meat and poultry inspectors conduct a continuing pesticide residue surveillance program to insure that meat from animals and birds slaughtered under Federal inspection is free from harmful pesticide residues. The Food and Drug Administration monitors the entire range of food products for the same purpose. In total diet studies done periodically on marketed foods eaten by a 16-to-19 year-old boy, the biggest eater in America, FDA tests have found that residue is either not present at all, or is found in amounts so small as to constitute no human health danger.

All pest control programs in which the Department participates and which involve the use of pesticides are monitored -- often by outside conservation agencies--for any adverse effects on wildlife, fish, and beneficial insects. The data obtained is used in the planning of future programs for maximum safety and effectiveness.

As part of a national program to monitor the total environment for pesticide residues, USDA scientists and technicians are engaged in checking the soil and water at 55 locations throughout the Nation to determine the extent and nature of residues traceable to agricultural chemicals. These locations cover both agricultural areas of high pesticide use and such non-farming areas as forests, plains, arid rangeland, and hardwood regions.

Federal Pest Control Programs Reviewed, Monitored

The Federal Committee on Pest Control, established in 1961 at the request of the Secretary of Agriculture, reviews all pest control activities in which the Federal Government participates. The committee, consisting of representatives of Agriculture, Interior, Defense, and Health, Education, and Welfare Departments, examines each proposal for soundness of planning and any possible hazards to the public generally and to wildlife. Similar review committees have been established in many states and provide an added safeguard against possible hazards in pest control programs where there is no Federal participation.

Federal pest control programs involve less than 3 percent of all the pesticides used in this country each year. When warranted, the use of pesticides in these programs is carefully monitored before, during, and after the program.

A U. S. Department of Agriculture Pesticides Committee also reviews and directs the Department's efforts to develop safe and effective control programs. The Committee cooperates with other Federal and State agencies and private organizations to coordinate research and to provide effective regulatory programs.

Quarantine Barriers

Federally established quarantines against agricultural pests have two objectives: To keep potentially dangerous insects and diseases from entering the country, and to prevent the spread of established pests from one State or region to another inside the country.

Most of our most destructive agricultural pests are of foreign origin. The majority of these were introduced prior to 1912 before the Federal Plant Quarantine Act was passed.

Plant quarantine inspectors of the U. S. Department of Agriculture intercept potentially dangerous pests at ports of entry on an average of once every 16 minutes. During 1965, inspectors prevented 32,572 insects, diseases, and other plant pests and 446,247 lots of prohibited plant material from entering the United States. They examined ships, planes, trains, cars, and -- in cooperation with customs inspectors -- over 36.6 million pieces of passenger baggage.

USDA animal quarantine inspectors, checking animals shipped to the United States, turned back more than 19,600 during 1965 because of disease and other livestock pests.

When a major pest accidentally manages to get through the quarantine barriers, the cost can be high to farmers and the public. A Federal-State program costing \$10 million including the expense of extensive aerial spraying was needed to eradicate the Mediterranean fruit fly after it slipped into Florida in 1956 and became established there. It would have cost the Florida fruit industry \$20 million a year to live with this pest.

Similarly the discovery of witchweed, a parasitic native of Africa, in North Carolina in 1956, led to a Federal-State control program which cost \$25 million through 1964. This pest is a potentially serious threat to the country's \$5 billion corn, sorghum, and sugarcane crops. Multiple herbicide treatments have succeeded in confining witchweed to 35 contiguous counties in North and South Carolina where the damage it does is minimal.

PEST CONTROL WITHOUT PESTICIDES

From necessity, pesticides will continue to be the major pest control weapons in the foreseeable future. However, their use has created special problems such as:

- some 70 species of insects in the United States have developed resistance to chemicals used against them.
- the misuse of some chemicals may result in harm to beneficial insects, birds, and other wildlife as well as fish.

Non-chemical pest control methods -- including biological, cultural, and mechanical -- are both very old and very new. These methods sometimes are sufficient, but more often their most effective use is in combination with chemical control. Research into non-chemical and specific chemical pest control techniques by the U. S. Department of Agriculture has received increasing emphasis and funds in recent years. More than two-thirds of the research on insects is now devoted to developing new biological controls for major pests and basic information about insects. The search for new ways of controlling weeds, diseases, and nematodes also is being greatly intensified by USDA.

Predators and Parasites

The biological approach to the control of insect pests was one of the early pest control weapons developed by U. S. Department of Agriculture scientists. In 1888, the Department sent an entomologist to Australia to seek natural enemies of the cottony-cushion scale which then threatened the citrus industry in California. He returned with the vedalia beetle, which devoured the scale and saved an industry.

U. S. Department of Agriculture scientific explorers have repeatedly traveled around the globe in search of insect parasites, predators, and diseases that might help control agricultural pests in this country. In all, some 650 species have been imported and at least 100 of these have become successfully established here.

A parasitic wasp brought here from Japan by U. S. Department of Agriculture scientists now helps reduce infestations of Japanese beetle in the Eastern States. Other beneficial insects introduced into the U. S. are providing some control of such major insect pests as gypsy moth and European corn borers, Larch casebearer, and balsam woolly aphid.

A beetle imported from Australia in 1944 has brought Klamath weed under effective control on 400,000 acres of western rangeland. The beetle feeds on the weed but does not eat grass or other valuable plants. Rangeland that was almost worthless for grazing because of this weed has been made useful again.

Sterilization, Attractants

The screwworm fly, a parasite of livestock, wildlife, and humans, has been eradicated from all but a small area of the Far West through a unique program conducted by the Department of Agriculture's Research Service and cooperating states. In this program, millions of male screwworm flies were sterilized by radiation. Released in infested areas, the mating of these sterile males with native females halted the reproductive process, wiping out this costly pest.

A number of chemical sex attractants of major insect pests have been identified and isolated. The use of these is being exploited in the hope that they will prove useful in control work.

Diseases Against Insect Pests

USDA scientists are also developing a kind of pest control observed in nature: The killing of insects by their own diseases. The ideal microbial insecticide is one that is highly infectious for at least one pest insect but preferably for a large number of kinds. It is easily and inexpensively produced. It is capable of being stored for a long period. And it poses no hazard to man, animals, or beneficial insects.

Certain carefully tested microbial insecticides are now being used under scientific guidance against some forest and farm pests in the United States and other countries. In addition, two kinds of microbial insecticides are being produced commercially in this country having been registered with USDA for specific uses. One preparation contains milky disease spores for killing Japanese beetle grubs, and the other is a bacterium for use on a limited number of crops to control certain kinds of caterpillars.

Trapping, Burning, Flailing

Three hundred and seventy light traps using ultraviolet or black light lamps caught from 50 to 80 percent of the adult tobacco hornworm moths in a USDA experiment covering a 113-square mile area of North Carolina. When unmated female moths were added to light traps, the catch of male moths greatly increased.

Flame cultivation, or the selective burning off of weeds using a mechanized multiple flame thrower, is gaining wider use in cotton and other crops as a result of the recent development of a new hooded flame nozzle and other refinements by USDA agricultural engineers.

Another new mechanical pest control technique developed by the Department involves a machine which vacuums up fallen immature cotton bolls or squares and destroys any boll weevils on them by flailing.

Pest-Resistant Plants

It usually takes several years to develop a crop variety resistant to a single pest, and much longer to incorporate multiple resistances to a complex of insects, diseases, and nematodes, which must be controlled on a single crop.

Twenty-four varieties of wheat resistant to the hessian fly are grown on 8-1/2 million acres in 26 States, with the net benefit to farmers estimated at \$16,000,000 to \$18,000,000 per year from use of these varieties.

The wide use in recent years of four USDA-developed varieties of alfalfa resistant to bacterial wilt disease has prevented an annual loss of \$100 million in farm income that would have resulted from planting wilt susceptible varieties on the same acreage.

Certain varieties of potatoes have been found resistant to at least 14 species of insects, including leafhoppers, Colorado potato beetle, and the tuber flea beetle.

Pesticides Information Center

The Pesticides Information Center was established in 1965 as part of the USDA's National Agricultural Library. Scientific and technical information on pests and their control is made available by the Center to scientists, administrators, and others working in the pest control field. A Pesticides Documentation Bulletin listing pertinent literature is published bi-weekly by the Center.

USE PESTICIDES EFFECTIVELY AND SAFELY

The U. S. Department of Agriculture carries on a continuing program to inform the public -- farmers, homeowners, gardeners, and others -- concerning the safe, effective use of pesticides. The Department distributes popular publications on the subject, furnishes radio and television stations with safety announcements, produces motion picture and exhibits for groups showing, and uses numerous other means of disseminating information to the public on pest control and pesticide safety.

Complementing and reinforcing the national pest control information program are the joint Federal-State cooperative educational programs conducted by the individual States working with USDA's Federal Extension Service. These programs are tailored to bring detailed information to specific audiences such as farmers, pesticide applicators and dealers, gardeners, and others who have specific pest control problems. In addition to mass media outlets, Extension makes frequent use of workshops and group demonstrations to encourage the safe use of pesticides.

The States receive all new information on Federal pesticide registrations and regulations, and on the latest research-based suggestions concerning the best means for controlling pests. This information is available to everyone through local county agents or State land-grant universities.

Among the materials issued by the U.S. Department of Agriculture on safe, effective use of pesticides are: Publications --"Your Home and Safe Use of Pesticides," "Farmers' Checklist for Pesticide Safety," "Safe Use of Pesticides," "Aerial Application of Agricultural Chemicals," and others. Motion pictures --"Pests or Plenty?" and "Safe Use of Pesticides." Slide set --"Safe Use of Pesticides."

Safety Rules for Pesticide Use

- ** Read the container label ... follow the directions.
- ** Mix pesticide solutions in a well-ventilated area, preferably outside.
- ** Avoid inhaling pesticide sprays or dust.
- ** Never smoke while handling pesticides.
- ** When using a pesticide outdoors, apply when there is little or no wind ... to minimize drifting of the spray or dust.
- ** Don't use pesticides near wells, cisterns, and other water supply sources.
- ** Avoid chemical contamination of streams, lakes, or ponds in order to protect fish and wildlife.
- ** When protecting food crops against pests, observe proper times and rates of application.
- ** Keep weed control chemicals away from flowers, ornamental shrubs, and other valuable plants.
- ** Wash with soap and water and change clothing immediately if you spill a pesticide on skin or clothing.
- ** If a pesticide is swallowed accidentally, call a physician at once. If splashed in eyes, flush with water immediately.
- ** Store pesticides in closed, well-labeled containers, where children and pets cannot reach them. Do not place near food, feed, or seed.
- ** Wrap empty pesticide containers, or those with unwanted pesticides, in heavy layers of newspaper and put them in the trash can, if trash collection service is available. If there is no such service, carry containers or surplus pesticides to sanitary land-fill type dump or bury at least 18 inches deep in a level, isolated place where water supplies will not be contaminated.



Use Pesticides Safely

FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE

